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Železniške naprave – Vodilo za specificiranje vodenega transportnega sistema

Railway applications - Guide to the specification of a guided transport system

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CENELEC

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REPORT

April 1998

English version

Railway Applications Guide to the specification of a guided transport system

This CENELEC Report has been prepared by the Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways. It was approved by the Technical Committee on 1997-06-03 and endorsed by the CENELEC Technical Board on 1997-07-01.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
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Foreword

This CENELEC Report was prepared by the CENELEC Technical Committee TC 9X, Electrical and electronic applications for railways.

It was approved by TC 9X on 1997-06-03 and endorsed by the CENELEC Technical Board on 1997-07-01.

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given only for information.

In this report, annex A is normative and annexes B and C are informative.

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ANNEXES TO THE EUROPEAN
STANDARD EN 50122-1
SPECIFICATION OF RAILWAY
TRACKS



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Introduction

In order to organize the field of harmonization of Railway Applications a series of survey groups considered the requirements of the railway industries of the CENELEC countries to assess the needs of suppliers and operators in respect of public procurement requirements.

These surveys led to the identification of a positive need for a range of Harmonization Documents (HD) which could become European Standards (EN).

Survey group 1 recommended, inter alia, the provision of a standard or standards to address the subject of Railway Systems.

Working group 5 determined that the field of application should be Guided Transport Systems (GTS). This Report has been produced in parallel with subgroup 5B which is responsible for Reliability, Availability, Maintainability and Safety (RAMS).

The harmonized approach is intended to facilitate the procurement of a complete Guided Transport System (GTS) and other parts.

This Report is to enable a harmonized approach to the procurement process for a GTS so that specifications for response to tenders (proposals) and following a contract specification the development and implementation stages (validation) can be carried out in a uniform manner. It can equally apply to its elements and subelements.

A GTS like any technical system includes three factors: man, machine and procedure in a given environment. This Report covers the general aspects.

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1 Scope

This Report gives guidance on a system structure so that a harmonized approach for decomposing a Guided Transport System (GTS) into its elements and subelements can be achieved.

It defines the main elements, their attributes and describes the contents of the attributes and also of the elements.

A numbering convention is recommended for indexing of the GTS specification and attributes.

It is not applicable to any other aspects of GTS specification such as feasibility studies or project management activities or the fields of finance, programme, terms and conditions and other contractual matters.

Lifts, escalators and travelators as well as systems dependent on aerial cableways for support are not included as Guided Transport Systems.

2 Normative references

This Report incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of these publications apply to this Report only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 1764*	Railway applications - Fire safety protection of railway vehicles https://standards.iteh.ai/catalog/standards/sist/1a63dd14-4141-41b4-b53411b2-1028785e/sist-r009-003-1998
ENV 50121	Railway applications - Electromagnetic compatibility
EN 50122-2	Railway applications - Fixed installations Part 2: Protective provisions against the effects of stray currents caused by d.c. traction systems
EN 50125*	Railway applications - Environmental conditions for equipment
EN 50126*	Railway applications - The specification and demonstration of dependability - Reliability, Availability, Maintainability and Safety (RAMS)
EN 60721-3-5	Classification of environmental conditions Part 3: Classification of groups of environmental parameters and their severities - Ground vehicle installations (IEC 60721-3-5)
IEC 60050(191)	International Electrotechnical Vocabulary (IEV) Chapter 191: Dependability and quality of services
IEC 60050(811)	Chapter 811: Electric traction

*In preparation

3 Definitions

For the purposes of this Report, the definitions given in IEC 60050(191) and IEC 60050 (811) apply together with the following:

3.1 Guided Transport System (GTS): A land-based system for transporting passengers and/or goods between defined locations and which has a fixed means of guidance on a dedicated path.

NOTE 1: GTS also includes trolleybus systems where the dedicated path is limited only by the power supply collection.

NOTE 2: Figures 1, 2 and 3 illustrate this definition.

3.2 system: A complex whole, a set of interrelated elements designed to carry out some purpose or function in a given environment.

3.3 system of interest: The system under consideration within a system hierarchy.

3.4 elements: The subsystems derived from the initial decomposition of a system of interest.

NOTE: Figure 1 illustrates the elements of a GTS.

3.5 GTS boundaries: Limits within which passenger/freight, public utility supplies, power supply and environment are the responsibilities of the GTS operations in respect of achieving its prime objectives.

NOTE: Figure 2 illustrates the GTS boundaries.

3.6 attributes: Characteristics, features, properties, qualities or constraints which impact on and influence the design and configuration of a system and its elements which can be measured or verified.

3.7 functional requirements: The fundamental actions or operations that the system of interest has to carry out to fulfil its prime objectives.

3.8 technical description: Describes a specific configuration which achieves the defined objectives.

3.9 environment: The surrounding objects, region, or circumstances which may influence the behaviour of the system and/or may be influenced by the system.

3.10 environmental conditions: Conditions which are brought about by virtue of the environment.

3.11 maintenance: The combination of all technical and administrative actions, including supervisory actions, intended to retain a product in, or to restore it to, a state in which it can perform a required function.

3.12 test and validation: Means of confirming that a system fulfils the needs and requirements as defined.

3.13 external interface: A boundary where a system interacts with any other or where a system interacts with its environment.

3.14 regulations: Rules and/or constraints placed upon a system by an external authority.

3.15 performance: A measure of the ability of a system to achieve the specified objectives.

3.16 track infrastructure: Track and related structures including all aspects of civil engineering which affect the GTS elements.

NOTE 1: Track infrastructure includes, for example, bridges and tunnels together with cant, curvature and gradient as well as track components.

NOTE 2: See also note 2 of 5.3.1.

4 System requirements

4.1 System concept

System requirements are usually determined from general transport feasibility studies and lead to the characteristics of the GTS. These requirements do not need to be defined in terms of attributes of the system structure given in clause 5 as they do not themselves have elements. They may take the form of introductory matter to the specification giving broad system requirements.

System requirements should be established and documented.

4.2 Systematic scope <https://standards.iteh.ai>

The general scope of a GTS is shown in figure 3 and is not limited to particular technology. For the purpose of this Report the expression high-speed should be understood in the same terms as the European Directive on this subject. 'People movers' are considered to include any low capacity system with limited journey times (distance) and are usually fully automatic, such schemes are often located in airports, but not exclusively.

4.3 System functions

The purpose of a GTS is to transport people and freight from one place to another safely, rapidly, regularly, on time and comfortably as follows:

- passengers and goods are transported by guided vehicles;
- provide access for passengers and goods into and out of vehicles;
- supply to passengers and staff traffic information.

Means are required for the operation of the GTS:

- a power supply for the provision of tractive effort and also for other subsystems;
- logistics;
- communications;
- human resources;
- etc.

5 System structure

5.1 Structure concept

The principal concept of the structure is to enable the decomposition of a GTS, and to describe its characteristics by linking the GTS, its elements and their respective attributes in the form of a matrix. Decomposition should result in elements which are expressed in functional terms.

Decomposition is based on a hierarchical breakdown in a top down process commencing with the GTS. In this case the GTS is the system of interest. Each element in the hierarchy becomes the next system of interest and can be further decomposed.

NOTE 1: Figure 4 shows the matrix of a system of interest with the attributes listed in the horizontal axis and the elements listed in the vertical axis.

NOTE 2: Figure 5 illustrates a typical hierarchical approach.

5.2 Attributes

The GTS and each successive system of interest should be defined by specifying the requirements in the form of attributes:

- (1) functional requirements;
- (2) external interfaces;
- (3) environmental conditions;
- (4) RAMS;
- (5) maintenance;
- (6) test and validation;
- (7) regulations and standards;
- (8) technical description.

NOTE: Figure 4 illustrates the attributes in the matrix. Further attributes may be added, if necessary. The attributes listed may also be divided into subsets, where appropriate.

All requirements should be uniquely identified in the specification. It is of vital importance to avoid vague and unclear requirements.

The attributes listed are applicable to the generic elements given in 5.3.1 and to other elements identified by further decomposition (see 5.3.2).

5.3 Decomposition

5.3.1 Initial decomposition

The initial decomposition of the GTS comprises the following generic elements. The order is not critical and does not imply a priority.

- (1) rolling stock;
- (2) signalling and controlling;
- (3) traction power supply;
- (4) communications;
- (5) access facility;
- (6) logistic support;
- (7) track infrastructure.

NOTE 1: Further elements may be added. It is recommended that not more than nine elements are used.

NOTE 2: Track infrastructure (7) is included as an element because it has a number of attributes (see 5.2) which have to be defined, i.e. external interfaces, regulations and standards and some aspects of technical description. Other attributes of track infrastructure are outside the scope of this Report.

NOTE 3: The association of the elements with their attributes (see 5.2) is shown in figure 6.

NOTE 4: Access facilities include terminals together with all equipment and auxiliary services. See also 7.5.

5.3.2 Further decomposition

Each of the major elements can be further decomposed into successively lower elements, as necessary. Each of these elements should have the attributes listed in 5.2 applied to it as before.

NOTE: A graphical example of this principle is shown in figure 7.

6 Attributes

NOTE: The purpose of this clause is to explain the scope of the different attributes.

6.1 Functional requirements

This subclause should cover all functions that the system of interest is required to perform together with its performance parameters.

All functional requirements and performance parameters should be measurable or capable of being evaluated using recognised models and criteria.

NOTE 1: It should cover all modes of operation and the performance in each mode.

NOTE 2: Performance parameters are measures which each function needs to achieve and which define how well the system and its system of interest operate.

6.2 External interfaces

This subclause should contain all interfaces external to the system of interest excluding the environmental conditions (see 6.3). Interfaces should be defined in terms of the following:

- physical interfaces (e.g. space envelope, physical connections);
- functional interfaces;
- operational interfaces.

In defining interfaces, the range of parameters within which the system performs should be specified. System behaviour in the event of the interface parameters exceeding the defined limits should also be specified.

Each external interface should contain a name, an identification number (see 8.2) and a brief description of each interface requirement.